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CQ

New Ham Survival Guide

***Inside:
Your Introduction to...***

- **FM Repeaters**
- **Computers and Radio**
- **The Rest of VHF**
- **The World of HF**

On the cover: Jeff Briggs, K1ZM
Photo by Larry Mulvehill, WB2ZPI

The New Ham Survival Guide from CQ...The Ham Radio Authority

Dear Fellow Ham,

Ham radio is a wonderful hobby, but to a newcomer, it's often overwhelming and intimidating. We'd like to help you get on the air quickly and with confidence. Since most new hams today start out on FM repeaters, you'll find two articles in this *Guide* on the nuts and bolts of how repeaters work and how to use them properly. You'll also find introductions to digital communications, other fun activities that await you on the VHF and UHF ham bands and the excitement of moving up to the HF bands with their worldwide coverage. In addition, we've got a basic glossary of "hamspeak" and a directory of references you can turn to for more information about a particular subject.

We hope the information in this booklet will give you the confidence to get on the air and start making lots of friends in your new, worldwide hobby. We also hope you'll enjoy your trial subscription to *CQ* magazine (if you got this *Guide* through our special offer) and that we'll be able to serve you for many years to come.

73 (best regards),

Dick, K2MGA

Dick Ross, K2MGA
Publisher, *CQ*

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So...What's a Repeater Good For?

By Chuck Gysi, N2DUP

Repeaters—you've heard about them and maybe even listened to one or two. But just what can repeaters *do* for you? The answer is "plenty." Let's take a look.

First of all, why do we need repeaters? Well, radio waves at VHF and UHF don't really travel too well on their own. Their range is generally what we call "line of sight," meaning that they don't travel much beyond the visible horizon. Repeaters are automatic relay stations that hams put up in high places, such as mountaintops or on tall towers, to significantly expand their signals' "line of sight."

How Repeaters Work

The typical repeater consists of five basic components: a *receiver*, a *transmitter*, a *controller* to link them together, a *duplexer* (which we'll explain below), and an *antenna*. When a signal enters the repeater's receiver, a circuit instantly and automatically retransmits it on another frequency. The duplexer goes between the radios and the antenna, allowing both the receiver and the transmitter to use one antenna. Plus, it helps keep the transmitter's signal from getting into the receiver, causing interference and reducing the receiver's ability to hear weak signals.



Repeaters can help you keep in touch from almost anywhere—even with just a handheld on a motorcycle.

All ham repeaters use this two-frequency system. When you operate through a repeater, you need to listen on the frequency the repeater transmits on, known as the repeater *output* frequency, and you transmit on the repeater's *input* frequency, where it listens. For most transceivers manufactured in the past

dozen or more years, repeater operation is pretty much automatic when you enter a frequency via the keypad or tuning dial. On 2 meters, your transmit frequency typically is going to be *offset* 600 kHz (0.6 MHz) from the frequency on which you receive the repeater. For instance, if you are listening to a repeater on 146.940 MHz, your transmit frequency is going to be 600 kHz *lower*, or 146.340 MHz. As a rule, input frequencies are 600 kHz *lower than* the output frequencies for repeaters transmitting below 147.000 MHz, and 600 kHz *higher* for repeaters that transmit above 147.000.

Other bands have different guidelines for repeater input and output frequencies. For instance, on the 222-MHz band, the input frequency is 1.6 MHz lower than the output, and on the 440-MHz band, the input frequency is 5 MHz either above or below the repeater's output frequency. See the *ARRL*

Repeater Directory for specific details on repeaters in your area.

A Variety of Uses

Some repeaters also include a device, called *autopatch*, that lets you place personal phone calls over the radio. You use the keypad on your radio to access the "patch" and dial calls. Different repeater groups have different policies on autopatch use, and most require that you join the sponsoring club in order to use it.

The extended range offered by repeaters can make FM operating lots of fun. They let you talk to people in a large geographic area with just a hand-held and stay in touch for many miles while operating mobile. Repeater also help you meet local amateurs and make new friends. They let you participate in emergency training and public service events and discover first-hand some of the fun that ham radio offers.

What's the Right Way to Operate on Repeaters?

By Chuck Gysi, N2DUP

One of the jiggst worries many new hams face is that they'll do or say something "wrong" on the local repeater, that they'll instantly be branded as a beginner, or worse, a CBer, and that no one will ever talk to them again. Sound familiar? Well, here

are some tips to help keep you on the favorable side of other repeater users when you go on the air.

Who's There?

The proper way to let others know you wish to communicate with them on



Listening to how things are done on repeaters in your area is a key to "fitting in" when you join in. This is Bill Lyon, KD4LLQ.

a repeater is to key your mic (assuming no one else is talking), wait a second or two, and, without dropping the signal, identify in this fashion: "This is N2DUP listening." In some areas, variations may be used, such as, "This is N2DUP monitoring." Listen to the local repeaters and see how the hams in your area ID when signing on for a chat.

Identify your station only once. If someone wants to talk with you and they didn't hear your callsign well enough, they'll ask you to repeat it. Why wait a

second or two before speaking? This is because the repeater may take a second to retransmit your signal, or you may be on a repeater that's linked to several others over a region. It takes a second or two for all the links to activate, and, if you don't wait after you "key up," the signal that all the other hams on the repeater may hear could turn into something like this: "...UP listening."

If there are other hams who wish to chat with you, they'll call you with perhaps something like, "N2DUP, this is KBØSAN. Howdy, the name on this end is Bob and we're mobile on the Pennsylvania Turnpike near Harrisburg." Notice how the ham responding to the initial call offered a little information about himself? You can respond likewise and then perhaps offer some additional information about yourself to keep the conversation going.

Mind Your Manners

Here are some other pointers for you to keep in mind for "well-mannered" repeater operating.

- If the repeater "beeps" at the end of each transmission, don't transmit until after you hear the beep. This "courtesy tone" probably resets the timer on the transmitter so it doesn't remain on the air too long. If you don't wait until after the beep, don't be surprised to hear other repeater users tell you that you "timed out" the repeater. In other words, the repeater stopped transmitting your signal in the middle of your transmission.

- The repeater will identify in voice or CW at least every 10 minutes, and so must you. You must also ID when you're done chatting. But you *don't* need to ID at the end of every transmission.

- Keep in mind that repeaters are owned and maintained by fellow hams, either on their own or through their local clubs. If you use a repeater that's run by a club, don't hesitate to join the group and help maintain the repeater with a dues payment.

- If you live in a metropolitan area, the repeaters with the widest coverage areas may be used by mobile stations keeping abreast of traffic conditions during morning and afternoon rush hours. If you're operating from your home, it's best to remain off the repeater during these times so the mobiles can exchange information.

What Not to Do

- Don't break into a conversation on the repeater unless you have something to add to the topic or unless you have an emergency to report. In most areas, the proper procedure to get a word in during a conversation is to wait for a station to stop transmitting, then ID with "N2DUP, break." Try to do this before any courtesy beeps, if possible. (That's another use of courtesy beeps: they allow other stations to get a word in, if necessary.) Again, listen first. In some parts of the country, use of the word "break" is discouraged, except for emergencies. In those areas, just drop your callsign in between transmissions.

- Don't talk too long. You run the danger of "timing out" the repeater. You may also make it hard for a station with an emergency to break in. Besides, long-winded monologues aren't appreciated on repeaters.

- Don't tie up a repeater when simplex communications are possible. (Operating simplex means moving off of a repeater frequency and making

direct contact with the other station.) If you're chatting with a mobile unit a mile ahead of you on the highway, switch to a simplex frequency, such as 146.520 MHz, and leave the repeater for those operators who need the extended coverage it offers.

- Don't become a "kerchunker!" Kerchunkers get their nickname from what they do—they transmit a quick but unmodulated carrier (simply by pushing the push-to-talk button on their microphone for a second or two), and the repeater responds by making a squelchy "KER-CHUNK" sound. Every repeater has kerchunkers...folks who like to check several times a day to ensure the repeater is still on the air. Technically, repeater kerchunking is illegal because the kerchunker is transmitting without identifying his or her station.

- And finally, don't use CB slang on amateur repeaters or engage in too much "hamspeak." There's no need to say "I'm destined" when what you really mean is simply "I'm home." And we still haven't figured out why it seems that every other ham you talk to on the radio refers to himself as "we." It's OK to say "I" when you're referring to yourself.

Keys to Success

The keys to successful repeater operating include common sense and common courtesy. Make it a habit to listen and learn how things are done on your particular repeater. And don't be afraid to ask questions. When you *do* get on the repeater and start talking, try to have something interesting to say, or ask something that might generate an interesting answer. But most of all, relax and *have fun!*

Computers and Radio—Your Digital Connection

By John Dorr, K1AR

Computers these days seem about as commonplace in homes as coffee makers. This is especially true with hams, and it's unusual today to find a hamshack *without* a computer. An entire industry has developed with products to support the emerging possibilities. Now "plugged-in" hams combine

computer and radio technology for an exciting new communication pipeline.

Packet Radio

Perhaps the most common application of radio and computer integration is packet radio, which lets you connect your computer to others via ham radio.



Paul Sobon, NOØT, runs the W4DW PacketCluster[®] system from his home in Raleigh, North Carolina.



Rich Burgan, WC8J, combines the pleasures of packet and satellites in his well-equipped PACSAT station.

The technology has been available commercially for a very long time. Even in amateur circles, the concept of sending “packets” of information generated by computer over the radio is not especially new. And today’s radios make it easy to try this fascinating mode. If you have access to a low-power 2-meter FM rig and a commonly available TNC (terminal node controller), you can put your personal computer “on the air”!

BBBs

One of the most popular things to do on packet is to access the huge number of packet bulletin board systems (PBBS) maintained by other hams. These PBBS sites allow you to upload/download information and data files, buy or sell used equipment, access useful databases, and exchange electronic mail messages. They’re similar to the BBS systems that computer users access via

modem and telephone line connections—the amateur radio version simply replaces the telephone line with the “airwaves.”

DX Clusters

Packet radio also provides access to PacketCluster® DX and contest spotting networks on which hams exchange real-time “spots” of stations that others may want to contact. This technology has completely changed the face of DXing, and you can now see the frequency locations and signal strengths of many DX stations displayed on your screen. Imagine the advantage you’ll have over hundreds of other hams “tuning the bands” when your computer screen lights up with rare stations. Once you sign onto the PacketCluster®, you can also use the network for such things as sending e-mail or accessing the latest radio propagation data. Recently, some

hams even discovered how to integrate PacketCluster® with the Internet, creating a truly worldwide network. It's very exciting to use a 5-watt FM rig and a small 2-meter vertical antenna to talk with another amateur around the world—all without phone lines or other traditional interconnections!

Other Cool Stuff

But packet radio isn't the only digital mode taking amateur radio by storm. Many of today's TNC units support many other digital modes, like RTTY, AMTOR, and PACTOR. These modes, used mostly on HF, are all variations on the basic theme of sending text over the radio. They are among the fastest grow-

ing areas of HF operation, and, through them, communication with far-away lands is now commonplace. Envision *your* screen lighting up with call signs from Angola to French Polynesia!

On or Off the Air

There are many other applications for radio and computer integration. They range from downloading weather satellite FAX images to specialized programs written for amateur radio, such as logging programs, antenna modeling, propagation forecasting, and radio control/interface. Why not explore them all? If you have the necessary equipment, investing 10 minutes of your time is all you'll need to begin enjoying some of the

The Rest of VHF

By Rich Moseson, NW2L

You've probably heard about, and maybe even tried, FM repeaters and packet radio (which puts your computer on the air). But a Technician license—the one most new hams start out with today—gives you ALL amateur privileges above 30 MHz. Let's look at what *else* that includes.

Repeaters in Orbit

Amateur satellites are orbiting repeaters with a *really* wide coverage area. Worldwide contacts are common using high-orbiting satellites that can "see" as much as half the world for large parts of their orbits. And nearly all ham satellites operate on VHF and UHF.

Using a satellite requires special equipment and antennas (at least for now). But you don't need anything spe-

cial to contact the orbiting packet station on the Russian MIR space station. Plus, a new generation of ham satellites—the first due for launch in mid-1996—promises much easier access, without the need for specialized gear.

Picture This

Your ham radio license is also a ham television license. More and more hams are connecting camcorders, and even computers, to ATV (amateur television) transmitters to exchange pictures with each other as well as words. Most ATV activity takes place in the 420-MHz portion of the 70-cm ham band and on higher frequency bands. There are ATV repeaters scattered across the country (they're listed in the *ARRL Repeater Directory*). Some



Bill Ramsey, KA8WTK, operates amateur television (ATV) and satellites from his "shack" in Tallmadge, Ohio.

hams use ATV in public service events and during emergencies, or as part of scientific research projects.

It's Over Your Head

High frequency (HF), or shortwave, radio signals travel great distances

because they can be refracted, or bent back, toward Earth by the ionosphere, an electrically charged upper level of our atmosphere. Generally speaking, the ionosphere isn't as efficient at refracting radio waves at VHF/UHF frequencies. In most cases, your communication



Stan Hilinski, KA1ZE, covers nearly the entire VHF/UHF spectrum from his car!

range is limited to your antenna's (or your repeater antenna's) visible horizon.

Sometimes, though, especially in the summer, the ionosphere gets more charged up than usual and begins to refract signals at VHF and above. These "band openings" are most common and have the greatest range on the 6-meter band (50 to 54 MHz). They're less common as you go up in frequency. Two-meter openings typically give you a range of several hundred miles, with similar distances possible on 222 MHz and 432 MHz.

It's possible to take advantage of band openings with your FM rig. But most VHF "DXers" (people who seek far-

away contacts) use single sideband (SSB) voice and Morse code (CW), both of which travel farther than FM signals.

Some VHF DXers make impressive contacts even when the ionosphere is not cooperative. They manage to bounce signals off of things that most of us would never even think of, such as the northern lights (aurora borealis), the trails of ionized air left behind by meteors as they burn up in the atmosphere, and even the moon!

So, if you ever get bored with your local repeater or packet bulletin board, remember you can spice up your ham life with some of the great variety that's available on the rest of VHF!

The World of HF Awaits You

By John Dorr, K1AR

One of the most common questions a non-ham asks a ham is, "How far can you talk on that radio of yours?" That's probably because the possibility of making and talking to friends around the globe (what we call "DXing") has always been one of the principal attractions of amateur radio. And that's exactly what HF, or high frequency, operating lets you do.

Despite the word "high," HF is actually *lower* in frequency than the VHF/UHF frequency bands most new hams are currently permitted to use. And, just as there's an exciting universe

above 50 MHz, there's plenty to marvel at on 160 through 10 meters, too! Let's find out what's in store for you.

DX and then Some

If you polled HF operators, nearly all could tell you about their first DX contact. Even in today's world of high-tech computer networking, there's nothing quite like the excitement of hearing a weak signal breaking through the noise from the other side of the world—and calling *you*! With millions of active amateurs in over 325 countries, it would be impossible to contact all of our plan-



In touch with the world...Hans Meurer, W2TO, at his HF station in New Jersey.

et's hams, so you have an endless source of new friendships. Whether your forte is SSB (voice) or CW (code), copying weak signals through the summer static on 80 meters or conducting regular ragchews with a friend living 10,000 miles away, there's little else in our hobby that compares with the thrill of operating on HF.

Although the lure of DXing is a major attraction of HF, there's also much more that this portion of our ham radio spectrum offers us. CW, while losing its usefulness in commercial applications, is still alive and well in ham radio. And it offers practical advantages when you're communicating over long distances from a smaller station setup. If you prefer SSB, or voice operating, you can explore a world of incredible diversity. A quick tour of the 20-meter phone band, for example, shows us everything from slow-scan amateur television to

radio nets passing health and welfare information about the latest catastrophe. You'll also find fascinating conversation, ranging from discussions of antenna experimentation to an Australian amateur describing the high cost of gasoline in his country.

On-Air Competition and Awards

If you have a competitive spirit, there are hundreds of opportunities to stretch your skills to the limit. On any given weekend, there's usually some type of radio competition where operators score points based on how many other participants they contact. Some of the best operators can log over 400 contacts per hour in these on-air contests!

And for you collectors, there's also an award for nearly every type of operating achievement. Whether they're won for

talking to 100 countries or to all of the Cantons (counties) in Switzerland, your award certificates will make for an impressive shack that's covered with colorful "wallpaper" that you've earned!

Let's Go Digital

In recent years, digital operating modes, such as RTTY, packet, AMTOR, and PACTOR, have soared in popularity. And, for a relatively small investment, you too can turn your HF radio station into a digital control center and communicate from your computer keyboard to points around the world! You'll have plenty of places to contact with

nearly every active country in the world "going digital."

But Most of All...

While there's so much to do on HF, most of us simply enjoy sitting by the radio and chatting with others who share our interests. That's the beauty of HF operating—it's a world that appeals to the newcomer and old-timer alike.

Whether you like to build 100-foot-high antennas, talk to as many countries as possible, operate from your car, or just make new friends, HF operating gives you wonderful opportunities to expand your ham horizons!

Glossary

Here's a handy guide to some of the ham radio terminology you'll find in this *Guide* and on the air. It's only the beginning of your instruction in a new language we call "hamspeak."

AMTOR (AMateur Teleprinting Over Radio)—A type of radioteletype (RTTY) with built-in error correction, commonly used by hams on HF.

BBS / PBBS (Bulletin Board System/ Packet Bulletin Board System)—Electronic message board accessed by computer, either over telephone lines or the radio. A PBBS is accessed via packet radio.

CQ—"Calling Anyone"; hams looking for a contact with any other ham will call "CQ." However, it is *not* used on repeaters. On a repeater, simply say "This is (your call) listening" or "This is (your call) monitoring."

CW (Continuous Wave)—Common abbreviation among hams for Morse code. (A CW transmitter sends out a continuous radio wave; a CW operator turns that wave on and off in the dot-dash pattern of Morse code.)

DX—Shorthand for distance. Generally used

by hams to refer to their fellow amateurs in other countries, or to the activity of trying to make DX contacts (DXing).

Five-by-nine—A signal report using the numerical "RS" code for Readability and Strength. A loud, clear signal is "five-nine" or "five-by-nine."

FM (Frequency Modulation)—The type of modulation used on VHF/UHF repeaters and by most VHF/UHF handheld and mobile radios. As you speak, the frequency, or bandwidth, of your signal varies in conjunction with your speech.

Full quieting—A strong signal into a repeater with no background noise audible.

Ham—An amateur radio operator. The term's origin is obscure and none of the many "true stories" has yet been proven. It is neither an abbreviation nor an acronym, so it is usually not written in capital letters. It's just plain "ham."

Ham Band or Amateur Frequency Band—A group of frequencies set aside for ham radio use. These are generally referred to by their approximate wavelength in meters, such as 2 meters or 70 centimeters; or by their frequency in MegaHertz, such as 440 or 222.

HF (High Frequency)—The range of radio frequencies between 3 and 30 MHz (MegaHertz). This includes nine amateur bands accessible to hams with General class or higher licenses: 160 m (meters), 80 m (sometimes called 75 m), 40 m, 30 m, 20 m, 17 m, 15 m, 12 m, and 10 m. Novices and Tech-plus licensees have limited access to 80, 40, 15 and 10m.

HT—Short for “Handi Talkie,” a Motorola trademark for its handheld FM radios. Many early amateur handhelds were converted Motorola Handi Talkies. The name HT came along with them and today is used to describe any handheld ham rig.

Meter (m)—1. A gauge or indicator (as in S-meter or wattmeter); 2. The basic unit of metric measurement (approx. 39"). Radio wavelengths are measured in meters, and ham bands are referred to interchangeably by their frequency in MHz (e.g., 440) or their approximate wavelength in meters (e.g., 2 meters).

Net—Short for **network**; it's a formal gathering of hams on a specific frequency at a specific time for a specific purpose. Most nets are regularly scheduled and have a Net Control Station (NCS), who directs the net's activity.

OM (Old Man)—A reference to any male ham.

Packet Radio—A form of digital communications in which computers linked by radio exchange data including messages, files, and computer programs. Information is packaged in small “packets” for accurate transmission, and unpacked for display on the receiving station's screen when received correctly.

FACTOR—A blending of **packet** and **AMTOR**, providing greater accuracy than **AMTOR** for HF digital communications.

Q-codes/Q-signals—Three-letter codes, beginning with “Q,” used by hams around the world to send information quickly, especially on CW. Q signals are also language-independent, meaning that, no matter what language you speak, “QTH” means whatever you'd say to tell someone where you are.

Repeater—An automatic relay device that simultaneously receives and retransmits radio signals. Repeaters are used to extend VHF communication range (see article).

RTTY (Radio Teletype)—Any text-based digital communications, such as packet, **AMTOR**, etc. However, most hams use **RTTY** to refer to one specific type of digital encoding, the Baudot, or Murray, teletype code.

Slow-scan TV—A type of amateur television (ATV) in which single still frames are transmitted line-by-line. This reduces signal bandwidth from approximately 6 MHz (for full-motion video) to 3 kHz, the width of an SSB voice signal, permitting exchange of images on the narrow HF bands.

SSB (Single Sideband)—The most common type of voice communication used by hams on HF. Also used on VHF and UHF, mostly for so-called “weak-signal” contacts.

TNC (Terminal Node Controller)—The component of a packet radio station that links the computer and the radio. It serves as a radio modem, assembles data into packets for transmission, and unpacks received packets for display on the computer monitor.

UHF (Ultra High Frequency)—The range of radio frequencies between 300 MHz and 3 GHz (3,000 MHz). Includes ham bands at 420 MHz, 902 MHz, 1.2 GHz, and 2.3 GHz. (There are additional ham bands on even higher frequencies.)

VHF (Very High Frequency)—The range of radio frequencies between 30 MHz and 300 MHz, including ham bands at 50 MHz (6 meters), 144 MHz (2 meters) and 222 MHz (1.25 meters). Also used generically to refer to all ham bands above 50 MHz.

XYL / YF (less common)—Means “wife.” Literally ex-young lady (see “YL”).

YL (Young Lady)—Any female ham, or generically, any girl or woman.

73—Best wishes or best regards. Used at the end of a contact. Try to avoid saying “Best 73s,” which means “best best wishes.”

88—Love and Kisses.

Where to Turn Next...

Still feeling daunted? Well, there are plenty more resources to help you get the most out of the hobby. So many, in fact, that we couldn't begin to do them justice in these few pages. Instead, we've provided you with contact information on some of the best resources in ham radio. Now it's up to you to start exploring, learning, and having fun.

Magazines (available on newsstands and by subscription/membership.)

CQ Amateur Radio, CQ Communications, 76 N. Broadway, Hicksville, NY 11801; phone 516-681-2922.

CQ VHF - Ham Radio Above 50 MHz, CQ Communications (available December, 1995).

QST, ARRL, 225 Main St., Newington, CT 06111; phone 860-594-0200.

73, 73 Amateur Radio Today, 70 Route 202-N, Peterborough, NH 03458; phone 603-924-0058, 1-800-274-7373.

Organizations

American Radio Relay League (ARRL); see *QST* listing for address.

AMSAT (Radio Amateur Satellite Corporation): P.O. Box 27, Washington, DC 20044; phone 301-589-6062.

Courage Handi-Ham System: 3915 Golden Valley Rd., Golden Valley, MN 55422; phone 612-520-0515.

Books on Basics

All About Ham Radio, HighText, P.O. Box 1489, Solana Beach, CA 92075; phone 619-793-4142, 1-800-247-6553.

First Steps in Radio (ARRL)

Ham Radio Horizons: the Book (CQ Communications/ARRL)

The VHF 'How-To' Book (CQ Communications)

Your Packet Companion (ARRL)

Your VHF Companion (ARRL)

Reference Books

CQ Amateur Radio Almanac (CQ Communications)

The ARRL Handbook (ARRL)

The ARRL Operating Manual (ARRL)

The ARRL Repeater Directory (ARRL)

Understanding Basic Electronics (ARRL)

The Packet Radio Operator's Manual (CQ Communications)

Lew McCoy on Antennas (CQ Communications)

Amateur Radio Rules, Part 97, FCC (available through ARRL's *The FCC Rule Book* and *CQ's Almanac*).

The Radio Amateur Callbook, Amateur Radio Callbook, 1695 Oak St., Lakewood, NJ 08701; phone 908-363-5679, 1-800-278-8477

Videos

Getting Started in Ham Radio (CQ Communications)

Getting Started in VHF (CQ Communications)

Getting Started in Packet Radio (CQ Communications)

Getting Started in Contesting (CQ Communications)

Getting Started in DXing (CQ Communications)

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